**Summary of Meeting #2, RTCA SC-186, Working Group 5**
**Development of a MOPS for UAT**

The meeting was held on 20-23 February 2001, at the Radisson Hotel in Melbourne FL, hosted by Rockwell-Collins. The meeting was called to order at 9 a.m. on February 20, 2001 by Co-Chairman George Ligler. George provided introductory remarks, welcomed all attendees and asked that each one introduce themselves and their organization. The attendees included:

| | | |
|---|---|---|
| Jerry Anderson – FAA (AIR-130) | Richard Jennings FAA (AIR-130) | Brent Phillips – FAA – ASD |
| Larry Bachman – JHU – APL | Stan Jones – Mitre CAASD | Robert Prill – BAE Systems CNI |
| John Barrows – FAA Tech Support | Richard Kulpinski – Mitre Corp. | Robert Saffell – Rockwell Collins |
| Mike Biggs – FAA (ASR-200) | Myron Leiter – Mitre Bedford | Ken Staub – Trios Associates |
| Andrew Comba – BAE Systems | Ian Levitt – Titan Corp (FAATC – ACT-350) | Terry Stubblefield – FAA (AFS-430) |
| Nikos Fistas - Eurocontrol | George Ligler – PMEI | William Thedford – Contractor (Hanscom) |
| Bill Flathers – Consultant (AOPA) | Jim Maynard – UPS Aviation Technologies | Hartmut Uhr – Infosys for Avitech, Germany |
| Gary Furr – Titan Corp. (FAATC-ACT-350) | Chris Moody – Mitre CAASD | Ed Valovage – Sensis Corp. |
| Jeff Giovino – Mitre CAASD | Tom Mosher – UPS Aviation Technologies | Richard Weathers – JCS J6I |
| James Higbie – JHU – APL | Al Muaddi – JHU – APL | |

1. Following introductions, regrets were announced as follows:
   a. Chuck LaBerge of Honeywell who is attending a SATCOM MOPS meeting in Phoenix AZ
   b. Greg Kuehl of UPS Airlines who is attending an FSIC meeting in Washington DC

2. George Ligler called for Agenda Item #2 to review the minutes and summary of Meeting #1 of this UAT MOPS Working Group. The meeting summary was approved with no further comment.

3. Brent Phillips was called upon to present Working Paper 2-08, the summary of the process for initiating SARPS for UAT within the Aeronautical Mobile Communications Panel (AMCP), in response to Action Item 1-5. Brent indicated that the SARPS for UAT would probably be considered under Working Group "C" (WG-C) of the AMCP. Brent indicated that there are six (6) AMCP member States that have shown some interest in UAT. Those States were: United Kingdom, France, Japan, Spain, Eurocontrol and Russia, not withstanding the "VDLM4" decision, who has recently sent representatives to view the Capstone project in Alaska. Additionally, both China and Brazil had been contacted and we are awaiting their reply. Brent indicated the WG-C will be holding a meeting in the 1st week of May and the WG-5 membership indicated that they would like to make a presentation to WG-C on the viability of UAT as a Data Link, in an effort to get work started within WG-C to get WG-B working on a frequency assignment. **Action Item 2-1** was assigned to George Ligler to provide Brent Phillips with statements received by RTCA from the UK CAA with regard to starting a UAT MOPS effort and SARPS development process. **Action Item 2-2** was assigned to Rich Jennings and George Ligler to prepare a presentation on the plans and status of WG-5 to be reviewed at Meeting #3 in Brussels for the purpose of preparing a final presentation for WG-C meeting in May 2001.

4. In response to Action Item 1-6, Chris Moody was called upon via Agenda Item 3d to present a position on GNSS/GPS in the UAT MOPS. Chris indicated that he felt the GNSS/GPS position had been addressed in his draft of Section 2.2 which we will be reviewing later during the meeting. After some discussion by the group, it was agreed that the primary challenge is with the air transport providers. In order to meet timing requirements, we may need an additional GPS unit in addition to the UAT avionics. **Action Item 2-3** was assigned to Chris Moody and Greg Kuehl to get together and work out an air transport configuration. They were directed to get words on an acceptable approach to extrapolation from the 1090 MHz MOPS (DO-260).

5. In response to Action Item 1-7, Jerry Anderson was called upon via Agenda Item 3e to present a response on the investigation of the derived requirements from the ADS-B Operational Safety Assessment (OSA) study. Using Working Paper 2-11, Jerry indicated that there were no link-specific requirements identified. However, there were other OSA requirements that resulted in several stringent safety proposals, which were still considered to be non-link-specific. However, the following appear to be ASA/ADS-B MASPS and/or link level requirements:

   - ADS-B data shall be encoded/encrypted so that the probability of successful spoofing is extremely improbable.

   - ADS-B shall consider frequency hopping spread spectrum techniques to protect against spoofing.

   Jerry's final recommendation of WP-2-11 was to refer the issue of spoofing/security to SC-186. As a result of this recommendation, the topic was discussed at the recent SC-186 Plenary held in Phoenix Arizona. It was reported that after Plenary discussion, the issue was tabled because of the potential cost of discovery and implementation of methods to defer spoofing. After WG-5 discussion, it was agreed that the UAT MOPS may need to require independent range validation in order to improve integrity.

6. Tom Mosher was then called upon to present Working Paper 2-12 in response to Agenda Item 5a for the review of the initial draft of Section 2.1 of the UAT MOPS. Several minor editorial comments were made during review of Section 2.1, and re-work of Table 2-3: "Transmitter Power Requirements" was requested. Additionally, George Ligler accepted **Action Item 2-5** to arrange for a presentation at Meeting #3 in Brussels by Costas Tamvaclis, or other Eurocontrol individual, on the UAT flight trials/tests, which have been performed by Eurocontrol. Tom Mosher will make the suggested revisions to Section 2.1 and resubmit them to the Working Group for future reviews.

   Further, in Section 2.1.13, as presented by Tom, there was a statement indicating that "Sensitivity requirements are –93 dBm at the antenna for 90% Message Success Rate for ADS-B Messages." **Action Item 2-6** was assigned to a group led by George Cooley of UPS Aviation Technologies (volunteered by Tom Mosher), to validate the –93 dBm receiver sensitivity over environment, or propose a different number, measured at the receiver input, and to prepare a report for presentation at Meeting #3 in Brussels.

7. Chris Moody presented a scatter chart representing Metroliner to ground beacon range comparison during an over-flight at 14000'/220kts. This chart became **Working Paper 2-16**. Chris explained that each dot on the chart represented a received message. For each received message, the distance between the receiver and the transmitter was calculated in two different ways. One way is by measuring the amount of time it took for the message to propagate from the receiver to the transmitter. The other way is by calculating the distance between the known receiver and transmitter positions (the transmitter position is obtained from the received message). A dot on the graph is the difference in these two calculations, which is really zero (0). So, Chris presented this graph, noting that the data points where the receiving aircraft was close to the Ground Beacon (over-flying it, in fact) diverge because he did not take slant range into account. The stable data points would be even better if we make a couple of compensations. One, by taking into account the slant angle, and two, by extrapolating receiver position to the time of receipt so that you are comparing apples to apples! The Working Group requested that two more charts be created from the data used to develop the presented chart. Chris Moody was assigned **Action Item 2-4** to generate these two charts for possible presentation to AMCP WG-C in May. Ian Levitt volunteered the services of the FAA Tech Center to take the chart data from Chris and produce the two charts for Meeting #3 in Brussels.

8. Jeff Giovino of Mitre CAASD presented Working Paper 2-15 in response to Agenda Item 7b, the "FIS Uplink." The presentation gave an overview of the UAT with regard to uplink message formats and utilization of the uplink. Jeff discussed the activity of the RTCA SC-195 FIS-B MASPS group and their use of the Application Protocol Data Unit (APDU) and their use of the HDLC protocol. Jeff described the Alaska Capstone implementation and finished with recommendations for the scope of the UAT MOPS in defining the format of the uplink payload. Recommendations proposed in the report include:

    - Define format of general uplink payload up to the Frame level only.
    - Refer APDU definition to other application MASPS/MOPS.
    - UAT MOPS should specify support for the following only:
        - Identifying uplink transmitter location and time slots
        - Proper delimiting of APDUs
        - Ensuring APDU integrity

    After discussion, the Working Group agreed with all of the recommendations presented in the presentation. Further, the Working Group wrestled with the issue of the FIS-B MASPS document requiring HDLC in a document that is supposed to be link independent. **Action Item 2-16** was assigned to George Ligler, Bill Flathers and Rich Jennings to discuss the HDLC issue with the FIS-B MASPS document group prior to the presentation of that document to the RTCA PMC in March.

9. Starting out Wednesday, 21 February 2001, Tom Mosher presented Working Paper 2-01 in conjunction with Agenda Item 3a, as a response to Action Item 1-1. Co-authors Tom Mosher and Richard Kulpinski presented the results of an evaluation into the feasibility of defining a two (2) frequency UAT requirement. The paper presented a two-frequency design, selectable by jumper and not dynamically selectable during flight. Any form of dynamically reconfigurability would be much more expensive. Their analysis showed that an approximate 40% increase in the cost of the UAT would result in perhaps a 35% to 50% decrease in voluntary General Aviation equipage. They concluded that dual frequency operation will increase recurring hardware costs by about 40%. It was noted by the Working Group that a change needed to be made in their conclusion, to indicate that "the baseline costs depend upon the technology selected and are expected to vary over time." Mike Biggs agreed that the presentation of this data provides a good data point for exactly what he was asking in Meeting #1 which resulted in Action Item 1-1 being assigned.

10. Next, Myron Leiter presented Working Paper 2-03 in conjunction with Agenda Item 3b, as a response to Action Item 1-2. The paper presented work performed by Warren Wilson and Myron Leiter, describing a number of possible UAT system enhancements designed to increase the robustness of UAT in the face of bursty interferers, particularly JTIDS/MIDS transmitters. The recommended changes were primarily changes to the error detection and correction schemes, and were examined in the context of a simulation which was validated using data measured on actual UAT and JTIDS equipment. Following Working Group discussion, **Action Item 2-7** was assigned to Myron and Warren at the request of Mike Biggs, in an effort to refine the investigation of each of their proposed enhancements to UAT by providing performance and cost feasibility considerations for each conclusion/recommendation presented in WP-2-03.

11. James Higbie gave a overhead slide presentation associated with his Working Paper 2-09 in conjunction with Agenda Item 3b, as an additional response to Action Item 1-2. In the presentation, James suggests sticking with 8-bit uplink symbols. James indicates that erasure encoding can substantially increase resistance to burst interference. He looked at the validity of presuming product effect for self-interference plus JTIDS and it was pretty close to first order. James had attempted to

reproduce the Mitre results presented in WP-2-03 and found that the results were in the ballpark, but different.

12. Bob Prill gave a presentation associated with his Working Paper 2-13, additionally in conjunction with Agenda Item 3b, as an additional response to Action Item 1-2. In the presentation, Bob suggested a double sideband transmit function with RAKE-like receiver using reception on two frequencies with at least 12 MHz frequency separation. BAE proposes a schedule to study their proposal over the next couple months. Following Group discussion it was agreed that this approach might have merit in that it could result in moving fewer DMEs, but there were lots of issues. Discussion of the issues were carried over into Thursday morning, resulting in several Action Items being assigned.

    - **Action Item 2-8** was accepted by Rich Weathers and Mike Biggs to establish Link 16 interference scenarios – two for high density, two for low density to be due not later than 15 March 2001.

    - **Action Item 2-9** was accepted by a team led by Mike Biggs for the purpose of looking at the effect of UAT on DME and vice-versa, using UAT and DME equipment located at the FAA Technical Center.

    - **Action Item 2-10** was accepted by Chris Moody on behalf of Mitre CAASD for the purpose of extracting the worst case DME environment between 978 and 981, and other frequency ranges as time permits.

    - **Action Item 2-11** was accepted by a team led by Myron Leiter to receive the scenarios identified by Mike Biggs in Action Item 2-8, the data resulting from Action Item 2-9 and the DME environment from Action Item 2-10 and run these scenarios versus their proposed changes to the UAT baseline, looking at one change at a time and them in combination for a comprehensive report due at Meeting #3 in Brussels.

    - **Action Item 2-12** was accepted by Stan Jones to take the statistics from John Barrows, the scenarios from Rich and Mike in Action Item 2-8, and incorporate them into his analytic model of the baseline UAT, including LAX 2020, and low-density self-interference, resulting in a report for Meeting #3 in Brussels.

    - **Action Item 2-13** was accepted by John Barrows and Myron Leiter to perform a quick addendum to Myron's previous work, to review additional interleaving techniques and up to 32 RS symbols, to include implementation characteristics/possibilities (e.g., classes of FPGAs).

    - **Action Item 2-14** was accepted by Bob Prill to break up enhancements proposed and analyze independently the different signaling alphabet; dual frequency approach for protection of DME, Link 16 and ATCRBS, and combination of both. Bob agreed to coordinate all of this with Mike Biggs and Mitre/Bedford and JHU/APL. Noting that the ability to move fewer DMEs is critical.

13. A presentation was made by Larry Bachman of JHU/APL on Wednesday afternoon from a collection of presentations that had been made over the last year to the Technical Link Assessment Team (TLAT), which described the JHU/APL simulations of all 3 data link candidates.

14. In conjunction with Agenda Item 4, Nikos Fistas of Eurocontrol presented Working Paper 2-14, which discussed the current and planned usage of the DME frequencies 978 – 982 MHz in Europe. Because of recent consideration by WG-5 for possible assignment of a UAT frequency at the 978 or 979 MHz frequency, this paper was presented to summarize the usage of those frequencies in

Europe. It was concluded that a search of the European navigation databases revealed a significant number of assignments in the 978 – 982 MHz bands. In addition, many of these assignments are paired with frequencies in other ARN bands and correspond to operational co-located facilities (ILS/VOR and DME). Following Group discussion, it was clear that a UAT frequency assignment has to be compatible with the European Navigation (DME) infrastructure in order to be acceptable in Europe.

15. Also in conjunction with Agenda Item 4, Mike Biggs of the FAA presented Working Paper 2-05, which summarized an overview of the current use of the 960 – 1215 MHz Aeronautical Radionavigation band. Mike discussed the past assignments for the UAT, and discussed where a permanent assignment may be possible with minimal impact on current DME assignments.

16. As Agenda Item 5d, Chris Moody then began a review of Working Paper 2-02, the proposed contents and transmission rates for ADS-B Messages. The paper proposed that the UAT MOPS address two types of ADS-B message payloads. One is the *MOPS defined* payload, which alone support all documented information requirements defined in RTCA DO-242, as well as those requested by Eurocontrol. The other type of payload is generated and defined external to the UAT MOPS – at least initially. These *externally generated* payloads are transmitted once by the UAT system "on condition" each time they are provided by the external source. These externally generated payloads could support future applications as they become better defined or they could support special user needs. After lengthy discussion by WG-5 regarding the formats of the payload types and the lengths of each field, it was agreed that James Maynard would work with Chris Moody to refine the definitions of these payload type as they are melded into Section 2.2 of the UAT MOPS for future review. Detailed review of WP-02 was not completed during this meeting. **Action Item 2-18** was assigned to a team led by Ed Valovage of Sensis Corp. to produce a recommendation on whether to use 5 or 6 bits for ground station identification, including rational taking into account needed anti-spoofing, and division of uplink labor between ground stations. The report of this Action Item will be scheduled for Meeting #4 at the Salem Oregon Headquarters of UPS Aviation Technologies.

17. As Agenda Item 7d, LCDR Richard Weathers gave a presentation on a complete overview of the DoD Link 16 system. Because of the sensitive nature of this presentation, it will not be made available via the UAT web site. It can be made available, on special request of the WG-5 Secretary, and as approved by LCDR Weathers. Of note is that the PDF file associated with this presentation is 1.984MB and is probably above the limits of most email systems for file attachment transmission. Any WG-5 member wishing to have the PDF file of this presentation should contact WG-5 Secretary, Gary Furr.

18. Friday morning started with Agenda Item 5e, when Ed Valovage of Sensis Corp. presented Working Paper 2-07, which is the 1st draft of Appendix D of the UAT MOPS, entitled "UAT Ground Infrastructure." Following WG-5 discussion on the ground infrastructure, **Action Item 2-20** was assigned to Rich Jennings of the FAA to discuss the potential of having a person(s) assigned from FAA-ASD to provide support for the development of Appendix D, similar to support provided for DO-260.

19. With adjournment of Meeting #2 set for noon on Friday, 23 February 2001, a quick summary of Action Items assigned during this meeting was reviewed. Additionally, note was taken that the meeting had not reviewed WP-2-04 (Draft of Section 2.2) and WP-2-06 (Potential Action Items Related to the Physical Layer), both papers offered by Chris Moody. George Ligler asked that all WG-5 members attempt to review these papers and provide comments directly to Chris Moody. Additionally, WP-2-10 (1st draft of Section 4) offered by Greg Kuehl was not reviewed. Again we ask that each WG-5 member review this document and provide comments directly to Greg Kuehl (phone: 502-329-6006 or email: air2gwk@air.ups.com)

20. During the 1st meeting of WG-5, December 18, 2000, the Working Group reviewed the sections of the proposed UAT MOPS and worked through the identification of individuals and organizations that would be responsible for writing drafts of those sections. The following table is the result of the assignments of those writing actions. The asterisk (*) beside a name indicates the lead person or organization.

**UAT MOPS Writing Assignments**

| Section | Version / Filename | Date / Due | Primary Author(s) | Status/Comments |
|---|---|---|---|---|
| | | | | |
| 1.0 Introduction | | Due 4/2001 | Bill Flathers *<br>Jerry Anderson | |
| 2.1 General Requirements | Sec_2-1a.pdf | 02/13/01 | Tom Mosher | |
| 2.2 Equipment Performance Requirements | Sec_2-2a.pdf | 02/12/01 | Chris Moody *<br>Bob Saffell<br>Rich Weathers<br>Jim Maynard<br>JHU-APL (?) | |
| 2.3 Environmental | | Due after 2.4 | Small 2.4 group | |
| 2.4 Equipment Test Procedures | | | Tom Pagano *<br>Bob Saffell<br>UPS-AT<br>Chuck LaBerge<br>JHU-APL (?) | |
| 3.0 Installed Equipment Performance | | | | |
| 4.0 Equipment Performance Characteristics | Sec_4a.pdf | 02/13/01 | Greg Kuehl | |
| | | | | |
| A. Glossary & Acronyms | App_A1.pdf | 01/03/01 | Rich Jennings<br>Terry Stubblefield | |
| B. MASPS Cross Reference Matrix | App_B1.pdf | 01/03/01 | Greg Kuehl<br>Jim Maynard<br>Nikos Fistas<br>JHU-APL (?) | |
| C. Example ADS-B Message Encoding | | | Chris Moody<br>+ 2.2 writers | |
| D. UAT Ground Infrastructure | App_D1.pdf | 02/14/01 | Ed Valovage *<br>Paul Gross | |
| E. Aircraft Antenna Characteristics | | | | |
| F. Link Budgets & Scenario Dependent Ranges | | | Larry Bachman | |
| G. Standard Interference Environments | | | Mike Biggs | |

21. The following table indicates the agreed upon meeting dates and places for meetings of Working Group #5 through August 2001. It was agreed not to set meetings later than August until the Working Group has had a chance to assess progress over the next several meetings. The Working Group will consider setting a date and place for one additional meeting as part of the Agenda for Meeting #3 in Brussels.

**Proposed dates and places for future meetings of the UAT MOPS Working Group 5:**

| Dates/Time | Meeting Place |
|---|---|
| February 20, 9:00 through noon February 23 | Radisson Suite Hotel Oceanfront, 3101 North Highway A1A<br>Indialantic, FL 32903 (321-773-9260)<br>Hosted by Rockwell Collins |
| April 2, 9:00 through noon April 5 | Eurocontrol Headquarters, Brussels<br>Travel info and lodging details are available on the ADS-B/UAT web site |
| May 1, 9:00 through 5pm May 3 | UPS-AT Headquarters, Salem, OR - Hosted by UPS-AT<br>Travel info and lodging details are available on the ADS-B/UAT web site |
| June 19, 9:00 through noon June 22 | MIT Lincoln Labs facility at Hanscom AFB, Lexington, MA<br>Travel info and lodging details are available on the ADS-B/UAT web site |
| July 31, 9:00 through noon August 3 | FAA WJH Technical Center, Atlantic City Airport, NJ<br>Travel info and lodging details are available on the ADS-B/UAT web site |

22. The following **Action Items** were identified during the course of this and previous meetings. The asterisk (*) beside a name or organization indicates that they are the lead. Because of the lack of time available for review of Action Items from Meeting #1, it was left to WG-5 Secretary to assign closure as deemed appropriate. The following table reflects the status of Meeting #1 Action Items and the description of Meeting #2 Action Items.

| Action Number | Action Description | Assigned to | Status |
|---|---|---|---|
| 1-1 | Can UAT be tunable within a small frequency range? Is there a difference in cost? Report results at the February 20 WG-5 meeting. | UPS-AT *<br>Bob Saffell<br>Richard Kulpinski | Addressed by WP-2-01<br>**CLOSED** |
| 1-2 | Take a close look at what we can do to UAT to make it cope with pulsed interference, DME, JTIDS. Report results at the February 20 WG-5 meeting. | Bob Prill<br>Warren Wilson *<br>James Higbie<br>Rich Weathers | Addressed by WP-2-03 and WP-2-09<br>**CLOSED** |
| 1-3 | Discuss with RTCA the availability of (electronic) FIS-B document for WG-5 members. | George Ligler<br>Rich Jennings | Available soon |
| 1-4 | Confirm meeting location at Eurocontrol, Brussels for April 2, 9am through noon April 5 | George Ligler | Confirmed<br>**CLOSED** |
| 1-5 | Discuss with US representative to AMCP (Brent Phillips) the possibility of presenting a UAT Position Paper at the next meeting of AMCP (May 2001). Report results at the February 20 WG-5 meeting. | Gary Livack | Brent to present at Mtg 2<br>**CLOSED** |

| Action Number | Action Description | Assigned to | Status |
|---|---|---|---|
| 1-6 | Present position paper on the role of GNSS/GPS in the UAT MOPS. Report results at the February 20 WG-5 meeting. | Chris Moody *<br>Bill Flathers<br>Tom Telton<br>Gary Livack<br>Chuck LaBerge | Addressed by Draft of Section 2.2<br>**CLOSED** |
| 1-7 | Are there any derived requirements from the existing ADS-B Safety Assessment document. Report results at the February 20 WG#5 meeting. | Rich Jennings<br>Jerry Anderson *<br>Chris Moody<br>Ray Yuan<br>Bill Thedford | Addressed by WP-2-11<br>**CLOSED** |
| 1-8 | Working paper on equipage classes for the review of WG#5 to be reported at the February 20 meeting. | Chris Moody | Addressed by Draft of Section 2.1<br>**CLOSED** |
| 2-1 | Provide Brent Phillips with statement(s) received by RTCA from UK CAA with regard to starting UAT MOPS effort and SARPS development process. | George Ligler | |
| 2-2 | Prepare a presentation on the plans and status of WG-5 to be presented at the May AMCP WG-C meeting. | George Ligler (*)<br>Rich Jennings | |
| 2-3 | Get together to work out an air transport configuration. Get words on an acceptable approach to extrapolation from the 1090 MHz MOPS. | Chris Moody (*)<br>Greg Kuehl | |
| 2-4 | Develop two charts based on slant range correction and perform some extrapolation, for presentation to WG-C | Chris Moody | |
| 2-5 | Arrange a presentation for the Brussels meeting, by Costas Tamvaclis or someone else, on UAT flight trials/tests performed by EUROCONTROL. | George Ligler | |
| 2-6 | Validate the –93 dBm receiver sensitivity over environment or propose a different number – measured at the receiver input, for report at the Brussels meeting. | Bob Saffell<br>Cyro Stone<br>George Cooley (*)<br>James Higbie | |
| 2-7 | Refine the investigation of possible enhancements to UAT by providing performance and cost feasibility considerations for each conclusion/recommendation presented in WP-2-03. | Warren Wilson<br>Myron Leiter | |
| 2-8 | Link 16 interference scenarios, 2 for high density, 2 for low density, due NLT 15 March. | Rich Weathers (*)<br>Mike Biggs | To be discussed at 9am 4/2/01 |
| 2-9 | Look at both directions UAT-DME effects to include 1 MHz bandwidth effect on adjacent channels. | Mike Biggs (*)<br>Ian Levitt<br>Al Muaddi<br>Larry Bachman | To be discussed at 9am 4/2/01 |
| 2-10 | Extract the worst case DME environment between 978 and 981. Will look at further range of frequencies as he can. | Mitre CAASD<br>Chris Moody (*) | To be discussed at 9am 4/2/01 |
| 2-11 | Run these scenarios (In Actions 2-8, 2-9 & 2-10) versus the Mitre proposed changes to the UAT baseline. Make results available for Brussels meeting. | Myron Leiter (*)<br>Warren Wilson<br>James Higbie<br>Al Muaddi | To be discussed at 9am 4/2/01 |

| Action Number | Action Description | Assigned to | Status |
|---|---|---|---|
| 2-12 | Take the DME Statistics from John Barrows, the scenarios from Rich and Mike and incorporate them into his analytic model of the baseline UAT, including LAX 2020 and low-density self-interference, for Brussels meeting. | Stan Jones | To be discussed at 9am 4/2/01 |
| 2-13 | Quick addendum to Myron's previous work, e.g., up to 32 parity symbols for RS, for Brussels meeting. | John Barrows (*)<br>Myron Leiter | To be discussed at 9am 4/2/01 |
| 2-14 | Look separately at effects of different signaling alphabet and dual frequency approach for protection of DME/ATCRBS. Coordinate with Mike Biggs, Mitre/Bedford and JHU/APL. | Bob Prill | To be discussed at 9am 4/2/01 |
| 2-15 | Derive to the degree possible, performance requirements for UAT delivery of FIS-B products, from the FIS-B MASPS. By 15 March 2001 | George Ligler<br>Bill Flathers<br>Stan Jones | |
| 2-16 | FIS-B MASPS – HDLC issue - prior to the document being presented to the RTCA PMC. | George Ligler (*)<br>Bill Flathers<br>Rich Jennings | |
| 2-17 | Look at a couple different error rates impact on the NEXRAD FIS-B display. | Chris Moody<br>Jeff Giovino (*) | |
| 2-18 | Recommendation on whether to use 5 or 6 bits for ground station identification, including rational taking into account needed anti-spoofing, and division of up-link labor between ground stations. We need to support TIS-B/ADS-B fusion, if possible. Report at Salem Meeting, 1-3 May. | Stan Jones<br>Ed Valovage (*)<br>Hartmut Uhr<br>Mike Biggs<br>Bill Thedford | |
| 2-19 | All members of WG-5 - provide comments to Greg Kuehl on Appendix D prior to Brussels meeting. | All WG-5 members | |
| 2-20 | Get a person(s) from FAA-ASD, and potentially FAA-Capstone, to provide support for the development of Appendix D similar to that supplied for DO-260. | Rich Jennings | |

23. The following **Working Papers** were identified during the course of this and previous meetings. These papers will be posted on the ADS-B UAT MOPS web site located at: http://adsb.tc.faa.gov

## SC-186 Working Group 5 – MOPS for UAT – Working Papers

| Working Paper | Size | Description | Introduced At: |
|---|---|---|---|
| | | | |
| SC186/WG5-WP-1-01 | 9KB | RTCA PMC Meeting Summary, 9/13/2000 | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-02 | 7KB | Letter from Steve Zaidman to RTCA requesting UAT MOPS by mid-2001 | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-03 | 186KB | UAT Overview, presentation by Chris Moody | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-04 | 7KB | Long-Term L-Band Spectrum Management Proposal, presentation by Jim Chadwick | Meeting 1, 12/18/00 RTCA |

| Working Paper | Size | Description | Introduced At: |
|---|---|---|---|
| SC186/WG5-WP-1-05 | 1,837KB | FAA Tech Center Capability in support of the UAT MOPS, presentation by Tom Pagano | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-06 | 782KB | Capstone Program Summary, presentation by Chris Moody | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-07 | 34KB | Eurocontrol ADS Programme Proposed Criteria for ADS-B Datalink Technical Assessment | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-08 | 516KB | ADS-B Operational Safety Assessment Report, dated Sept. 20, 2000 | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-1-09 | 132KB | System Description for the Universal Access Transceiver as published in the "Phase One Link Evaluation Report, Status and Initial Findings," Appendix D, dated November 1999 | Meeting 1, 12/18/00 RTCA |
| SC186/WG5-WP-2-01A | 40KB | Tunable UAT Evaluation presented by Tom Mosher, in support of Action Item 1-1 (modifications as requested during the meeting) | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-02 | 49KB | Proposed Contents and Transmission Rates for ADS-B Messages, presented by Chris Moody | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-03 | 85KB | Preliminary Results on Possible Enhancements to the Universal Access Transceiver (UAT), presented by Warren Wilson in support of Action Item 1-2 | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-04 | 82KB | Draft #1 of Section 2.2 of the UAT MOPS, presented by Chris Moody | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-05 | 138KB | Considerations in the Selection of the Universal Access Transceiver (UAT) Operating Frequency, presented by Mike Biggs and Chris Moody | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-06 | 9KB | Potential Action Items Related to Definition of UAT Physical Layer, presented by Chris Moody | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-07 | 24KB | Draft of Appendix D, "UAT Ground Infrastructure," presented by Ed Valovage | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-08 | 16KB | UAT SARPS Initiation, presented by Brent Phillips, AMCP U.S. Member in support of Action Item 1-5 | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-09A | 128KB | Investigation of Possible Enhancements to UAT, presented by James Higbie in support of Action Item 1-2 (with slides added as shown during the meeting) | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-10 | 27KB | Draft #1 of Section 4 of the UAT MOPS, presented by Greg Kuehl | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-11 | 11KB | Review of the ADS-B Operational Safety Assessment (OSA) Report, presented by Jerry Anderson in support of Action Item 1-7. | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-12 | 23KB | Draft #1 of Section 2.1 of the UAT MOPS, presented by Tom Mosher | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-13A | 14KB | BAE Double Sideband Transmitter / RAKE-like Receiver for Protection against L-16 / JTIDS Interference, presented by Bob Prill | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-14 | 35KB | Results on the DME usage of the Frequencies 978-982 MHz in Europe, presented by Nikos Fitas | Meeting 2, 02/20/01 Melbourne, FL |

| Working Paper | Size | Description | Introduced At: |
|---|---|---|---|
| SC186/WG5-WP-2-15 | 151KB | The General Purpose UAT Link (FIS Uplink), presented by Jeff Giovino and Chris Moody | Meeting 2, 02/20/01 Melbourne, FL |
| SC186/WG5-WP-2-16 | 34KB | A graph of Metroliner to Ground Beacon Range Comparison during over-flight at 14000'/220kts, Presented by Chris Moody | Meeting 2, 02/20/01 Melbourne, FL |